furrow close to the edge and paralleling it; surface smooth, heavily encrusted and laccate, dark bay to black; context thick, soft, felty, light buff, deepening in color near the tubes, often with tissue of white mycelium irregularly disposed in lower part near stipe; tubes long, 3 to 5 per mm.; crust of vertical solid palisade hyphae, dense and compact, 50 to 60 μ long; varnish heavy, 15 to 20 μ deep; spores ovoid, slightly asymmetrical, light brown, smooth, with echinulate thick walled endospore; spines coarse and relatively few; spores 7.4 by 11.9 to 8.4 by 14.0 μ.

On conifers in western North America. See Figs. 7, 16 and 17.

This species was first described by Murrill in North American Flora, at which time it was known only from the type locality in Oregon. It is now known to occur generally on the Pacific slope, and has been collected on a number of conifers besides *Picea sitchensis*, on a log of which it was first found. It bears a close resemblance to Atkinson's *G. pseudoboletum* var. *montanum* but has definitely larger spores.

SPECIMENS STUDIED

(a) *Ganoderma oregonense.*

HERBARIUM J. H. FAULL: specimen 3691 on *Tsuga heterophylla*, Sonora Island, British Columbia; spec. 6706 on Douglas Fir, Royston, B. C.; spec. 9355 on conifer, Vancouver, B. C.

HERBARIUM NEW YORK BOT. GARD.: spec. 6 (*type*) on old log of *Picea sitchensis*, near Seaside, Oregon; spec. coll. by H. D. House, Martha's Lake, near Everett, Wash.

(b) *Ganoderma Curtisii.*

HERBARIUM J. H. FAULL: spec. 3568 on Oak, Thomasville, Ga.; spec. 3682 on dead hardwood, Pinehurst, N. C.; spec. 175.

HERBARIUM NEW YORK BOT. GARD.: spec. 4389 on dead wood; spec. on dead Oak, Biloxi, Aug. 31, 1904. E. G. E.; spec. on *Quercus rubra* stump, Alliston, Mo.; spec. coll. by B. B. Higgins, Experiment, Ga.; spec. 545 ex. Herb. A. Commons; spec. coll. by W. A. Murrill, Biltmore, N. C., Oct. 1907; spec. coll. by Edwin Fowler, on root of Maple, Trenton, N. J., labelled *G. sessile.*

(c) *Ganoderma lucidum.*

HERBARIUM J. H. FAULL: spec. 181 *G. lucidum*, on *Betula alba*, Toronto, Ont.; spec. 183 *G. lucidum* on Oak stump, Toronto; spec. 182 *G. lucidum*, on *Betula lutea*, Wilcox Lake, Ont.; spec. 179 *G. lucidum* forma *montanum*, Vosges,

France, ex Herb. G. F. Atkinson, 21077; spec. 9718 *G. lucidum*, on fallen Spruce, Remi Lake, Ont.; spec. 185 *G. Tsugae*, on *Tsuga canadensis*, Toronto, Ont.; spec. 3470 *G. Tsugae* on *Tsuga canadensis*, East Angus, Prov. Qebec; spec. 5422 *G. Tsugae* on *Tsuga canadensis*, Algonquin Park, Ont.; spec. 1579 *G. Tsugae* on *Tsuga canadensis*, Toronto, Ont.

HERBARIUM NEW YORK BOT. GARD.: spec. 645 *G. Tsugae* coll. by W. A. Murrill, Aug. 7–10, 1904; spec. 1157 *G. Tsugae* on Maple log, Cadillac, Michigan; spec. on decaying stumps of Hemlock; spec. 2529 *G. Tsugae;* spec. 11 *G. Tsugae* coll. by A. H. Mackey, Nova Scotia; spec. 3281 *G. Tsugae* on *Tsuga canadensis*, Sturgisson, W. Va.; spec. 536 on old log in Rhododendron Valley coll. by W. A. Murrill, labelled *G. sessile.*

FARLOW HERBARIUM (all labelled *G. lucidum*): Fung. Fenn. 239 (Karsten); Fung. Gall. 180 (Roumerguère); Fung. Brit. 2nd. Ed. 101 (Cooke); Fung. Brit. 1st. Ed. 603 (Cooke); Myc. March. 2106 (Sydow); Fung. Sax. 1116 (Krieger).

(d) *Ganoderma sessile.*

HERBARIUM J. H. FAULL: spec. 9335 *G. sessile* on *Acer saccharinum*, Cambridge, Mass.; spec. 1221 *G. sessile* on living *Ulmus americana*, Port Credit, Ont.; spec. 1551 *G. sessile* on living *Ulmus americana* Port Credit, Ont.; spec. 180 *G. sessile* on Elm stump, Ithaca, N. Y.; spec. 9525 *G. sessile* on living *Fraxinus americana*, Cambridge, Mass.

ATKINSON HERBARIUM in the New York State College of Agriculture: spec. 19560 *G. subperforatum* Atk. (type).

HERBARIUM NEW YORK BOT. GARD.: spec. 734 *G. sessile* ex Herb. G. Commons; spec. 2575 by stump of *Acer rubrum*, Gold Station, Md.; spec. 1430 *G. sessile;* spec. 1435 *G. sessile;* spec. 1 ex. Herb. L. O. Overholts; spec. 446 ex Herb. N. M. Glatfelter on Black Oak, St. Louis; spec. from Miss Sadie F. Price, Bowling Green, Ky.; spec. 2323 ex Herb. A. P. Morgan; spec. 32 *P. lucidus* Leys., Cincinnati, Ohio; spec. marked *G. sessile type*, from old Oak stump, Bedford Park; spec. *G. sessile* on Red Maple stump, N. Y. Bot. Gard. autumn, '08; spec. 25 *G. sessile* typical; spec. *G. sessile* on partly dead trunk *Acer rubrum*, on road from Clason's Point to Unionport, New York City; spec. 2507 Flora Ludoviciana legit A. B. Langlois, St. Martin's Ville, La.; spec. *G. sessile* on Norway Spruce stump, coll. W. A. Murrill and P. Wilson, Williams Bridge, New York City.

HERBARIUM RUSH P. MARSHALL: spec. on *Tilia americana*, Washington, D. C.; spec. on *Ulmus americana*, Andover, Mass.; spec. on *Acer saccharum*, Glastonbury, Conn.

FARLOW HERBARIUM (the following are labelled *G. lucidum*): Myc. Univ. 104 (de Thümen); Erb. Critt. Ital. series I 769; Fung. Europ. 1213 (Rabenhorst); Myc. Venet. 9 (Saccardo).

ADDENDUM

The following table shows the dimensions of spores of most of the species of *Ganoderma* recorded in the North American Flora, other than those studied in this paper, as determined by the writer from specimens in the Herbarium of the New York Botanical Garden:

Species	*Dimensions*	*Dimensions given in the North American Flora*
G. Sequoiae	6.7–7.4 x 11.9–14.2 μ	none
G. nevadense	7.4 x 11.9–13.4 μ	none
G. oregonense	7.4–8.4 x 11.9–14.0 μ	none
G. sulcatum	5.9 x 11.9–12.6 μ	4–4 x 8–10 μ
G. nitens	7.4–8.2 x 10.4–11.9 μ	none
G. tuberculosum	7.4–8.2 x 9.7–11.2 μ	6 x 8 μ
G. zonatum	5.2–5.9 x 10.4–11.2 μ	4–6 x 8–10 μ
G. subincrustatum	6.7–7.4 x 9.7–11.2 μ	4 x 8 μ
G. sessiliforme	5.9–6.7 x 8.9– 9.7 μ	none
G. argillaceum	5.2–6.3 x 8.9–10.4 μ	7 x 12 μ
G. subfornicatum	5.2–5.9 x 9.7–10.4 μ	4 (globose) μ
G. stipitatum	5.2–5.8 x 7.4– 8.2 μ	3.5 x 5 μ

Many of the foregoing are represented by specimens from the type locality only. The species can be grouped according to the character of their spores, whether resembling those of *G. sessile* ("smooth" type) or those of *G. lucidum* ("rough" type), as follow:

Species having thin-walled spores; the echinulations of the endospore fine

G. argillaceum
G. sessileforme
G. sulcatum
G. subincrustatum
G. zonatum
G. stipitatum
G. subfornicatum

Species having thick-walled spores; the echinulations of the endospore coarse

G. Sequoiae
G. nevadense
G. nitens
G. tuberculosum

The writer is indebted to Professor J. H. Faull for suggesting the subject and for direction throughout this research. He is also under obligations to the curators of the Herbarium of the New York Botanical Garden, and of the Farlow Herbarium for affording free use of their collections.

SUMMARY

1. The history of the genus *Ganoderma* is briefly reviewed and attention drawn to the diversity of opinion in regard to the limitations of the genus, a situation due to the inadequacy of the original description and various subsequent modifications. Based on the distinctive organization of the crustal layer of the sporophore, and the remarkable structure of the spores, the genus is a well defined one.

2. The distinctive features of the crust are a peculiar "palisade" layer composed of modified hyphae, and a resinous cuticle which is secreted superficially.

3. The spores are smooth externally, though appearing rough from the numerous echinulations of the endospore.

4. Two sub-types of spores are recognized, (1) those with thick walls and relatively few, coarse echinulations on the endospore, and (2) those with thinner walls, and many finer echinulations on the endospore. The spores of any given species are of one type only.

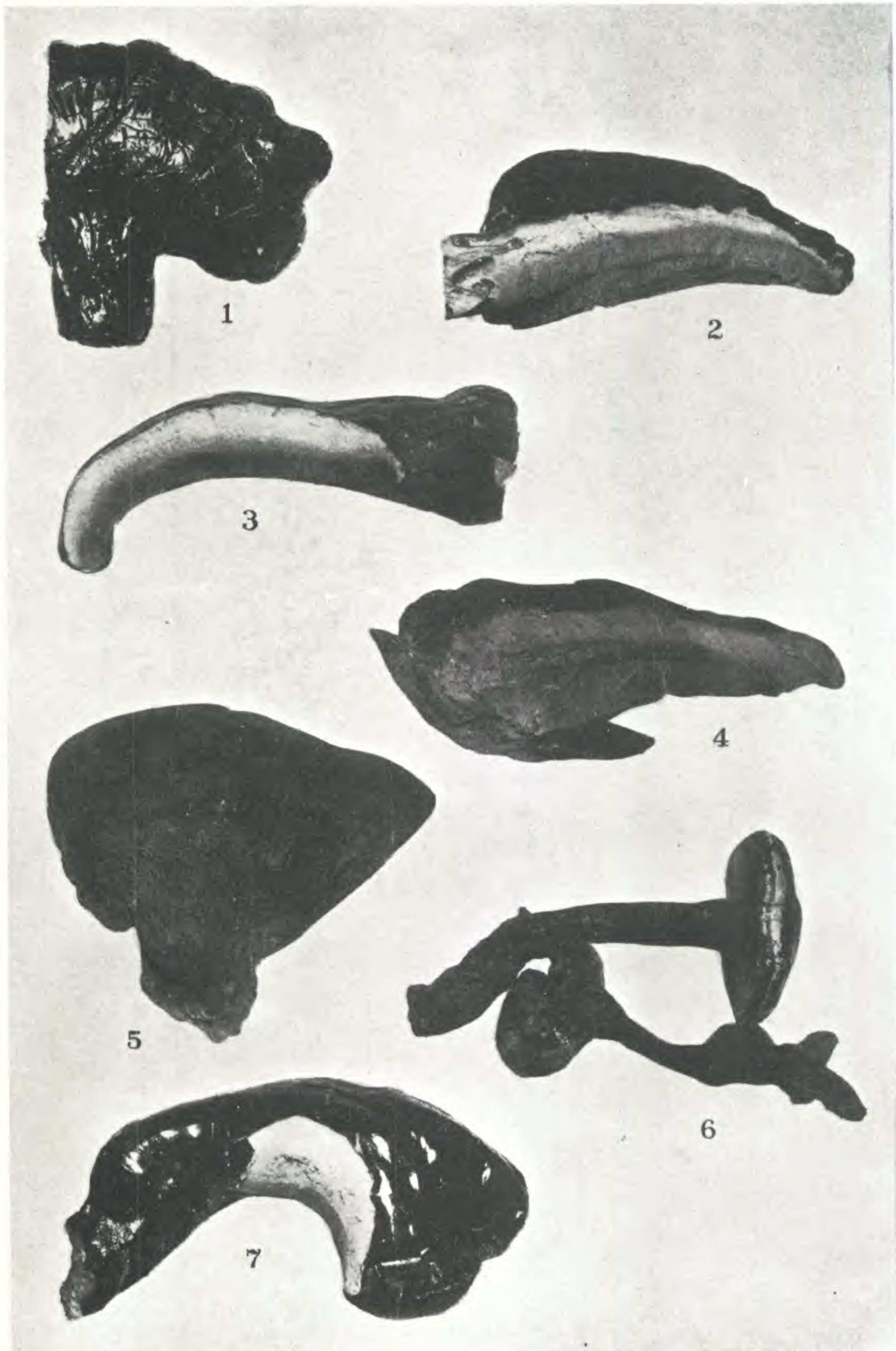
5. The morphological characters of the sporophores, particularly of the crust and spores, are of paramount importance in the determination of species. According to our present knowledge there is no justification for assuming strict host specificity in this group; such an assumption in the past has led to erroneous specific determinations.

6. These studies have been confined to four temperate zone species as follows:

(a) *G. lucidum* (Leys.) Karst., a polypore found in Europe and America on hardwoods and conifers. It is especially common on Hemlock in America. The sporophore is distinguished by its heavy varnishing, and well developed "palisade" layer, its uniform context, and its thick-walled spores with coarsely echinulate endospore surface. *G. Tsugae* Murrill is a synonym.

(b) *G. sessile* Murrill, a polypore found in North America and in Europe on hardwoods (rarely conifers ?). It is distinguished by comparatively lightly varnished, distinctively colored and marked sporophores. The sporophore has a duplex context, a somewhat thinner and more irregular palisade layer than *G. lucidum*, and thin-walled spores with very finely echinulate endospore surface. *G. subperforatum* Atk. is a synonym.

(c) *G. Curtisii* Berk., a polypore reported only from the eastern half of the United States. The sporophore is distinguished by its exfoliating crust, its duplex and darkly colored context, and its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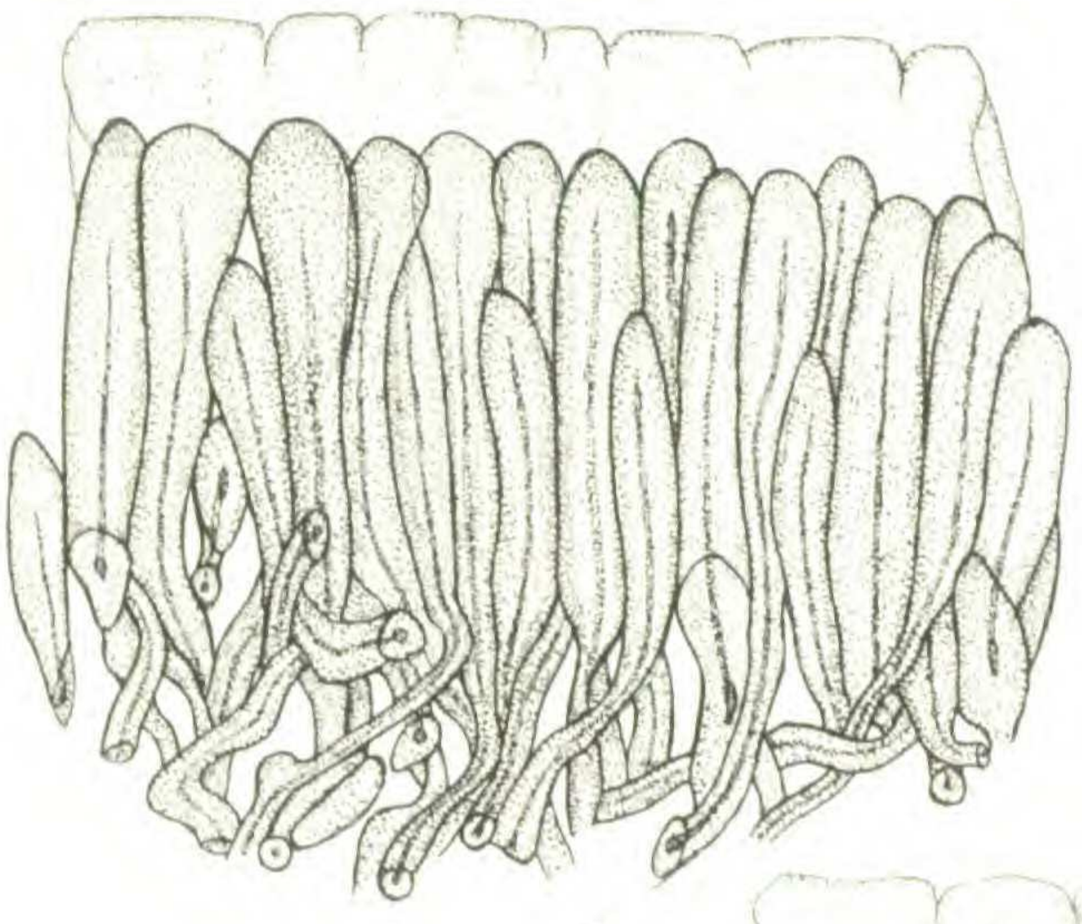

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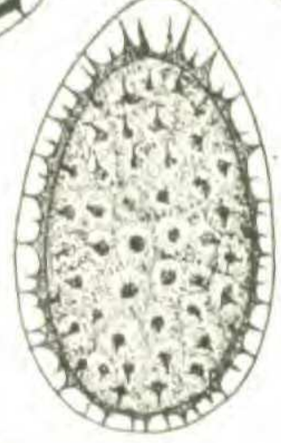

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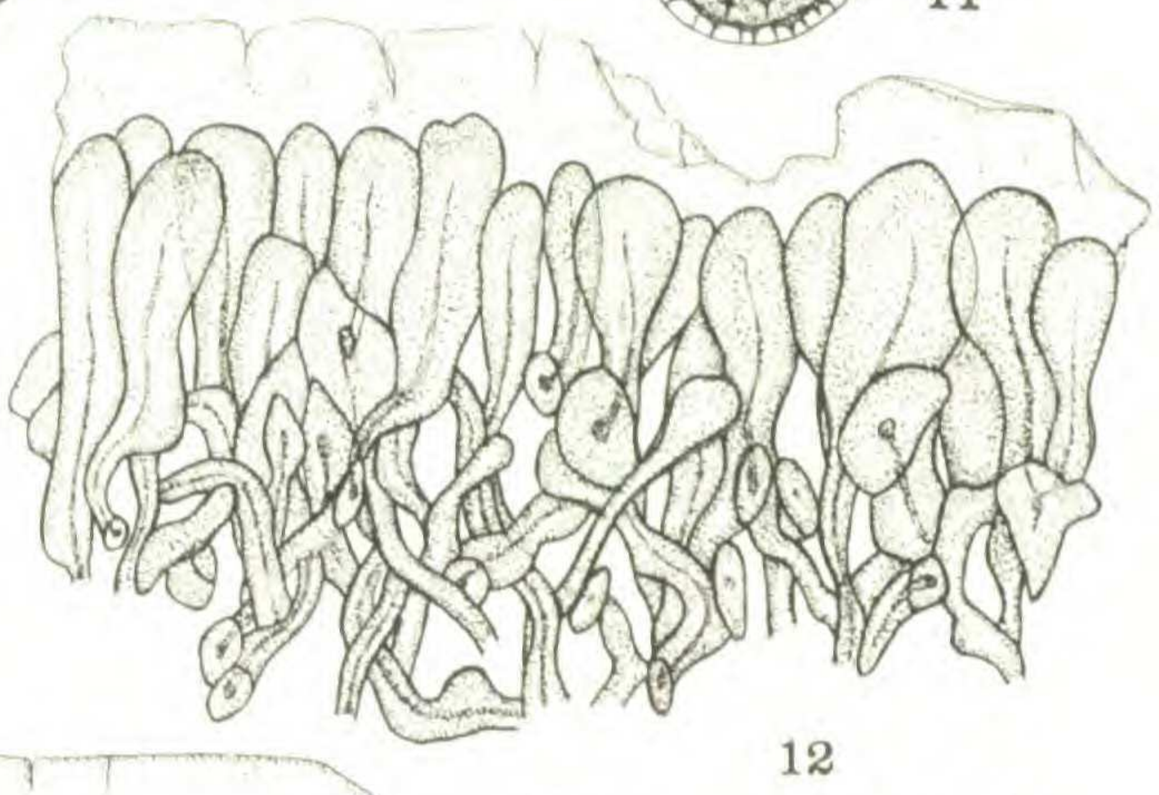

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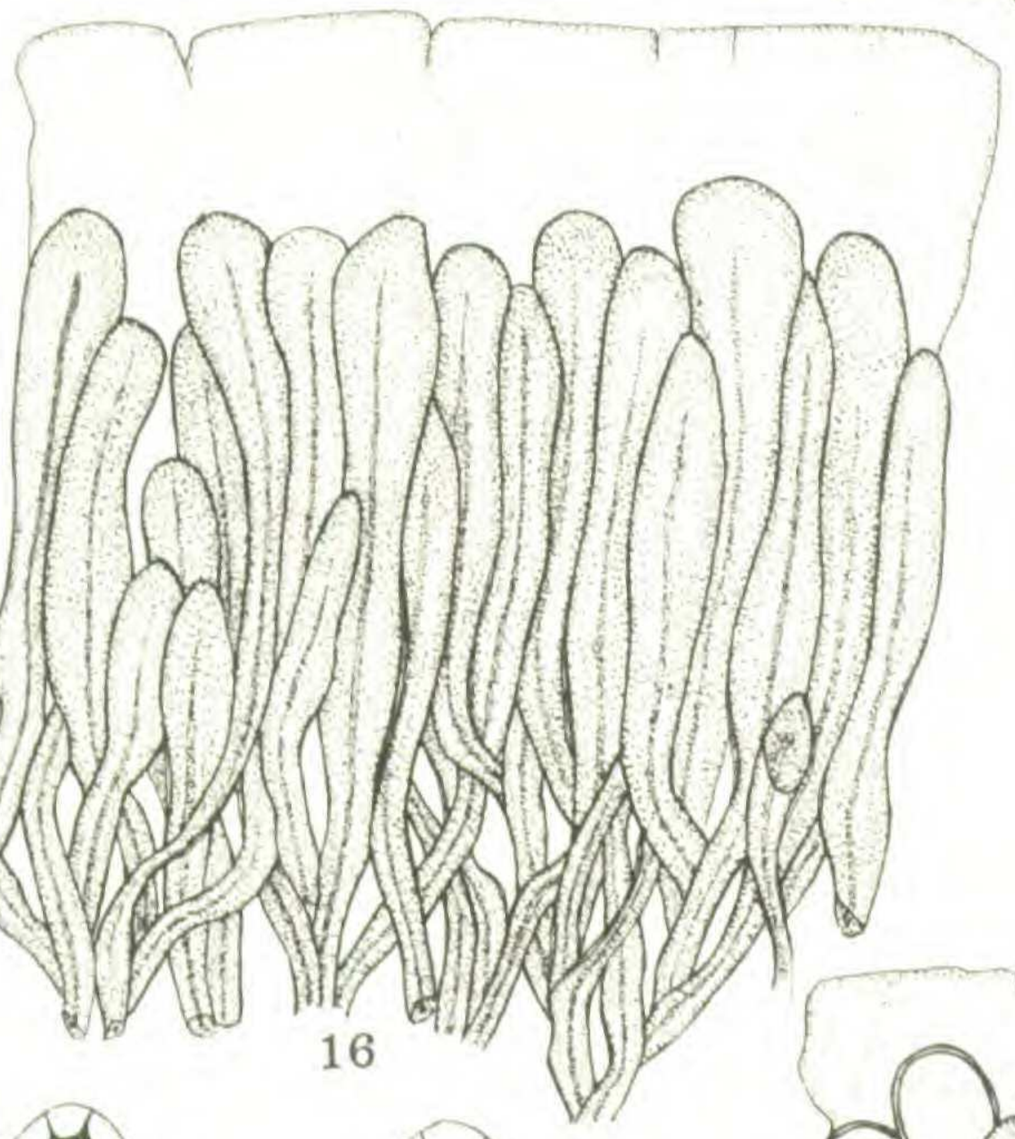

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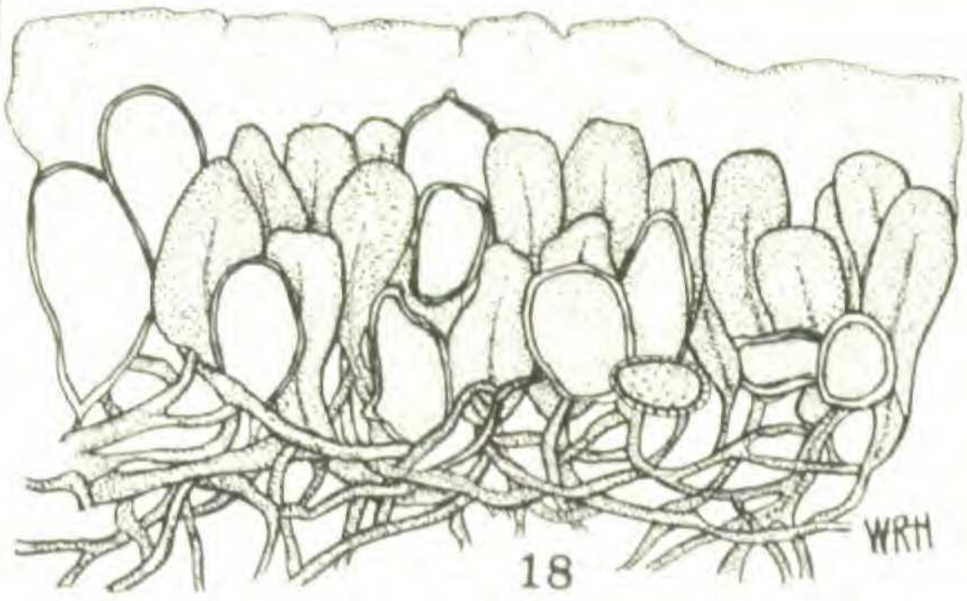

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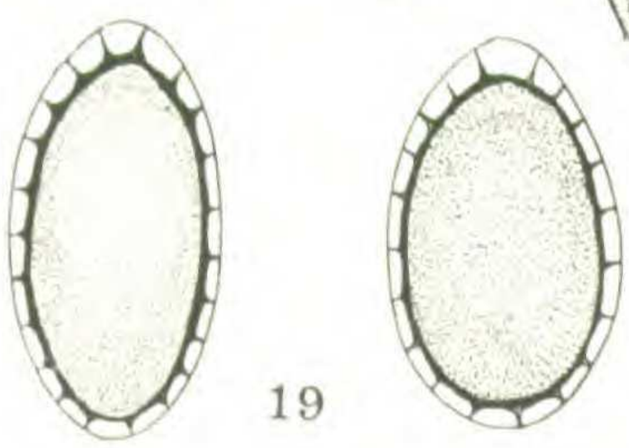

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spores of variable size, which are coarsely echinulate on the endospore surface.

(d) *G. oregonense* Murrill, a species found in western North America on conifers. The sporophore is distinguished by its dark color, its very heavily varnished surface and deep crustal layer, its thick soft uniform context, and its relatively large spores which have coarse echinulations on the endospore surface.

7. A list of the specimens studied is recorded, and also a record of measurements of the spores of most of the species described in the North American Flora.

PATHOLOGICAL LABORATORY, ARNOLD ARBORETUM
HARVARD UNIVERSITY.

EXPLANATION OF FIGURES OF PLATES 29 AND 30

Fig. 1. Photograph of the upper surface of a sporophore of *G. lucidum* (the Remi Lake specimen, on Spruce. Herb. J. H. Faull, spec. 9718); × .3.

Fig. 2. Photograph of a sporophore of *G. lucidum* showing three years' growth and that of the current fourth. (Herb. J. H. Faull, spec. 185); × .5.

Fig. 3. Photograph of sporophore of Fig. 1 in vertical section; × .5.

Fig. 4. Photograph of sporophore of *G. sessile* in vertical section (Herb. J. H. Faull, spec. 180); × .5.

Fig. 5. Photograph of same sporophore, upper surface view; × .5.

Fig. 6. Photograph of sporophores of *G. Curtisii* (Herb. J. H. Faull, spec. 3568); × .4.

Fig. 7. Photograph of sporophore of *G. oregonense* (Herb. J. H. Faull, spec. 9355); × .3.

Fig. 8. Vertical section through crust of *G. lucidum* (Herb. J. H. Faull, spec. 9718); × 550.

Fig. 9. Sectional view of a spore of *G. lucidum;* × 1575.

Fig. 10. Sectional view of a spore of *G. lucidum*. This spore is rather larger than the average; × 1575.

Fig. 11. Surface view of a spore of *G. lucidum;* × 1575.

Fig. 12. Vertical section through crust of *G. sessile* (Herb. J. H. Faull, spec. 180); × 550.

Fig. 13. Sectional view of a spore of *G. sessile*. This spore is rather larger than the average; × 1575.

Fig. 14. Sectional view of a spore of *G. sessile;* × 1575.

Fig. 15. Surface view of a spore of *G. sessile;* × 1575.

Fig. 16. Vertical section through crust of *G. oregonense* (Herb. J. H. Faull, spec. 9355); × 550.

Fig. 17. Sectional view of spore of *G. oregonense;* × 1575.

Fig. 18. Sectional view through crust of *G. Curtisii* (Herb. J. H. Faull, spec. 3604); × 550.

Fig. 19. Sectional view of spore of *G. Curtisii;* × 1575.

Fig. 20. Sectional view of spore of *G. Curtisii;* × 1575.

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PTERIDOPHYTES COLLECTED FOR THE ARNOLD ARBORETUM ON VANIKORO, SANTA CRUZ ISLANDS, BY S. F. KAJEWSKI

E. B. COPELAND

IN 1928 while collecting for the Arnold Arboretum in the New Hebrides Mr. S. F. Kajewski paid a visit to the Santa Cruz Islands and collected on Vanikoro Island from October 17 to December 15 188 numbers of plants of which 32 were Pteridophytes. Descriptions of the new species and notes on species already known follow. A list of all the species of Pteridophytes collected will be published later with the general enumeration of the Vanikoro plants.

Cyathea Veitchii (Baker), comb. nova.

Alsophila Veitchii Baker, Syn. Fil. ed. II. 41 (1873).

SANTA CRUZ ISLANDS: Vanikoro, common in rain-forest, alt. 50 m., no. **545**, Oct. 28, 1928 (trunk up to 15 m. tall; fronds three to four meters long).

Baker's description is very brief, but fits this fern as far as it goes. It is clearly one of the group of *C. lunularis*, the type-group of *Alsophila*. Costae and costules are rather densely squamulose beneath; pinnules conspicuously caudate; sori small and very numerous.

Tectaria grandifolia (Presl) Copeland in Philip. Jour. Sci. Bot. II. 413 (1907).

SANTA CRUZ ISLANDS: Vanikoro, rain-forest, no. **507,** Oct. 18, 1928 (Fern with large fronds up to 1.5 m. high; sterile fronds much smaller, about ¾ m. high).

A species of uncertain status, based on a Cuming collection which was probably a mixture; apparently intermediate between *T. crenata* and *T. decurrens*. The rachis and the upper end of the stipe may be broadly winged, or the lower pinnae may be free. Described from the Philippines, and not positively known elsewhere.

Oleandra angusta, sp. nova.

Rhizomate scandente, paleis appressis lanceolatis castaneis pallide marginatis ciliatis vestito, 3 mm. crasso; pedicellis 2 mm. longis, approximatis non verticillatis, paleis similibus minoribus vestitis; stipitibus 2 cm. longis, gracilibus; fronde 25–30 cm. longa, 10–14 mm. lata, utrinque longe attenuata, subcoriacea, costa paleis angustis 1 mm. longis horizontaliter distantibus ornata, lamina inferiore pilis nonnullis deciduis adspersa, aliter glabra, non ciliata et vix marginata; venis furcatis, tenuibus, arcte approximatis; soris 1.5–3 mm. a costa remotis, parvis, indusio nudo, firmo, oblique acroscopice aperto.

SANTA CRUZ ISLANDS: Vanikoro, rain-forest, alt. 50 m., no. **537,** Oct. 25, 1928 (a branching fern found on giant Kauris).

A species well distinguished by its long, slender fronds with attenuate base, long stipe and short pedicel, paleate costa, and remote lines of sori. The veins are very fine and close; as they reach the margin, they are spaced about twenty to the centimeter.

Lindsaya Kajewskii, sp. nova.

L. Lapeyrousii affinis, pinnis acroscopice bipinnatifidis distincta; rhizomate terrestri, brevirepente, intricato; stipitibus subcaespitosis, 2–3 cm. longis; fronde usque ad 30 cm. longa, media longitudine 4–5 cm. lata, utrinque angustata; pinnis medialibus 2.5 cm. longis, 1 cm. latis, basiscopice usque ad alam angustissimam costae excisis, recurvis, acroscopice in pinnulas ca. 4 unilateraliter subpinnatas et ca. 2 simplices ad alam aequi-angustam pinnatis; segmentis pinnulae quaeque majoris ca. 3, lineari-cuneiformibus; vena

in segmento quoque aut simplice aut furcato; soro solitario, infra-apicale.

SANTA CRUZ ISLANDS: Vanikoro, common in rain-forest, alt. 50 m. no. **523,** Oct. 20, 1928 (growing on large rain-forest trees).

This species and *L. Lapeyrousii* constitute a group, of which *L. Blumeana* may be a representative with pinnate rachises, the affinity of the group as a whole being to that of *L. decomposita*, all anastomosis of veins of course disappearing with the fine dissection of the frond. *L. hymenophylloides* is not a member of this group; it and *L. fissa* are correspondingly finely cut relatives of *L. macraeana*.

Lycopodium Kajewskii, sp. nova.

Phlegmaria, caulibus pendentibus usque ad 75 cm. longis, repetiter dichotomis, foliis inclusis 15–18 mm. crassis; foliis confertissimis, patentibus, subcoriaceis, 7–8 mm. longis, basi 2 mm. latis, acuminatis; spicis plerisque simplicibus, usque ad 10 cm. longis, 1.2–1.5 mm. crassis, sporophyllis deltoideis sporangiis aut aequantibus aut paullo longioribus.

SANTA CRUZ ISLANDS: Vanikoro, rain-forest, alt. 100 m., no. **573** (type), Nov. 6, 1928 (a common parasite on rain forest trees); same locality, alt. 50 m., no. **520,** Oct. 20, 1928 (common, growing on large forest trees); same locality, alt. 100 m., no. **624,** Nov. 12, 1928 (a parasitic plant, common on the great Kauri).

Well marked in its group by the small and exceedingly numerous leaves, and slender spikes.

Herter in Beiblatt zu den botanischen Jahrbüchern, nr. 98, p. 22, (1909), has reported *L. Phlegmaria* and *L. phlegmarioides* from Vanikoro; also *L. serratum*, *L. phyllanthum* and *L. oceanianum* from the New Hebrides. Kajewski has collected what I suppose is *L. oceanianum* on Efate island. From Vanikoro, he sends 9 sheets,—3 of *L. Kajewskii*, 2 of *L. Phlegmaria*, and one each of *L. cernuum*, a related species (sterile), *L. vanikorense*, and *L. nummulariifolium*.

Lycopodium vanikorense, sp. nova.

L. setaceo affine gracilius, de arboribus pendente, caulibus repetiter dichotomis, deorsum foliis inclusis 5 mm. crassis; foliis subappressis, rectis, 8 mm. longis, vix 1 mm. latis, acutis, plerisque trifariis, saepe angustissime pallide-marginatis, sursum decrescentibus et fertilibus, ramis fertilibus 3–4 mm. crassis foliis 5 mm. longis.

SANTA CRUZ ISLANDS: Vanikoro, rain-forest, common, alt. 50 m., no. **521,** Oct. 20, 1928 (found growing on large rain forest trees).

Distinguished from *L. bolanicum* by less spreading leaves and

consequently more slender shoots, and particularly by the more slender apices; from *L. Parksii* by the straight (not inflexed) and less acuminate leaves. *L. proliferum* Blume, ascribed by Herter to this group and by Baker to that of *L. squarrosum*, is unknown to me.

A SYNOPSIS OF ROBINSONELLA

Eva M. Fling Roush

With seven text figures

A SYNOPTICAL treatment of this group was thought advisable because of the difficulty of specific determination due to the scattered literature, the inadequacy of the original descriptions, the lack of a key to the species, the extreme variation in the form of leaf, the degree of pubescence and the small number or fragmentary nature of the specimens upon which some of the species were founded.

Robinsonella, a genus of tree mallows of the American tropics, named in honor of Dr. B. L. Robinson of the Gray Herbarium of Harvard, was established by Rose and Baker in 1897 with three species of which two, *R. cordata*, type of the genus, and *R. divergens*, were new, the third, *R. Lindeniana*, having formerly been referred to *Sida* and *Abutilon*. Only seven species are known at present and all are worthy of cultivation because of their showy flowers; they are, however, suited for subtropical and tropical regions only.

The author is indebted to those in charge of the following herbaria for the privilege of examining their material: the Arnold Arboretum and the Gray Herbarium of Harvard University, the New York Botanical Garden, the United States National Herbarium, the Missouri Botanical Garden and the Field Museum of Natural History.[1] Appreciation is due Mr. Alfred Rehder of the Arnold Arboretum for assistance and suggestions in the preparation of this paper.

Robinsonella Rose & Baker in Gard. & For. x. 244 (1897).—K. Schumann in Engler & Prantl, Nat. Pflanzenfam. Nachtr. II. 42 (1900).—Standley in Contrib. U. S. Nat. Herb. XXIII. pt. 3, 760 (Trees & Shrubs Mex.) (1923).

Shrubs or small trees up to 9 m. high, much branched, the younger and more herbaceous parts more or less stellate-pubescent (rarely pilose). Leaves alternate, petiolate, mostly ovate or orbicular in

[1] AA, Arnold Arboretum; F, Field Museum of Natural History; G, Gray Herbarium of Harvard University; M, Missouri Botanical Garden; NY, New York Botanical Garden; US, United States National Herbarium.

outline, palmately 5–7-veined, up to 25 cm. long, cordate, subcordate or rounded at base, acute, acuminate or obtuse at apex, entire, dentate or more or less lobed; the lobes vary much in shape, size, number and dentation; petioles vary in length and pubescence; stipules if present, caducous. Flowers large, showy, in ample panicles or in small clusters on short lateral branchlets; bracts small, lance-linear; pedicels articulated near the middle or toward the apex, pubescent or puberulous; calyx cup-shaped, ebracteolate, deeply 5-parted, open or reflexed in fruit, externally densely stellate-pubescent or tomentose (rarely pilose), on the inner upper part arachnoid-pilose in the young stage; nectaries if present forming a pubescent 5-angled ring at the base of the calyx within; petals obovate, unguiculate, with a tuft of hairs on each side of the claw forming the so-called "weel," rarely pubescent dorsally toward the base; staminal column conic, varying in length with the size of the flower, glabrous or stellate-pubescent, dividing into numerous filaments; cells of the ovary 9–13, uni-ovulate; the ovule pendulous, becoming apparently basal by the rapid growth and inflation of the upper portion of the ovary; style-branches as many as the cells of the ovary, exceeding the stamens; stigmas capitate, papillose. Carpels 9–13, compact or spreading, obtuse at apex, thin, membranous, slightly veined, much inflated at maturity, perhaps tardily dehiscent from the base up along the back, the seed often hanging by a slender thread which runs dorsally along the full length of the carpel; seed very small, dark, glabrous or sparsely stellate-scurfy.

TYPE SPECIES: *R. cordata* Rose & Baker in Gard. & For. x. 244 (1897).

DISTRIBUTION: From the State of Durango in Mexico south to Costa Rica in Central America.

Robinsonella belongs in the tribe Malveae because the carpels are of the same number as the style-branches and the staminal column is antheriferous at the summit; to the subtribe Sidinae because of the capitate stigmas. It is most closely related to *Sida* and *Gaya* by the uni-ovulate cells of the ovary in which the seed is pendulous. It is distinguished from *Sida* by the more tree-like habit, by the thin, membranous, non-reticulated and much inflated carpels which are obtuse (erostrate) and more or less divergent and separable, by the seed which occupies only a small space in the base of the carpel, by the sepals being smaller than the petals and open or reflexed at maturity. The species of *Gaya*, on the other hand, are herbaceous or suffruticose with undivided leaves, and chiefly yellow, sometimes purplish flowers which are pedunculate and solitary in the axils, often racemose; the apices of the mature carpels are

connivent, but separate from the persistent axis and are dorsally dehiscent into two valves at maturity.

KEY TO THE SPECIES

Inflorescence cymose-paniculate, terminal or axillary; leaves more or less lobed.
Leaves 3–5-lobed.
Leaves deeply 3- or 5-lobed, lobes ovate-oblong, constricted at base.....1. R. *Lindeniana*
Leaves more or less 3-lobed, lobes blunt or obtuse..2. *R. divergens*
Leaves only slightly and irregularly lobed, often unequally-sided 3. *R. edentula*
Inflorescence not paniculate, flowers solitary or in 2's or 3's on short lateral branchlets; leaves obscurely or not at all lobed.
Leaves discolorous, with a fine, dense, appressed silvery tomentum beneath, more or less coarsely dentate.....4. *R. discolor*
Leaves green on both sides.
Leaves furfuraceous-tomentose beneath, ferrugineous on the veins, shortly acuminate.....5. *R. subcordata*
Leaves loosely stellate-pubescent beneath.
Leaves pilose on the veins and petioles.....6. *R. cordata*
Leaves not pilose on the veins or petioles, glabrescent. 7. *R. pilosa*

1. Robinsonella Lindeniana (Turcz.) Rose & Baker in Gard. & For. x. 245 (1897).—Standley in Contrib. U. S. Nat. Herb. XXIII. pt. 3, 760 (Trees & Shrubs Mex.) (1923).—Fig. 1.

Sida Lindeniana Turczaninow in Bull. Soc. Nat. Moscou, XXXI. pt. 1, 200 (1858).—Hemsley, Diag. Pl. Nov. II. 24 (July 1879); Biol. Cent. Am. I. t. 9, 105 (Nov. 1879).—Gray in Proc. Am. Acad. Arts Sci. XXIII. 295 (1888).—Baker in Jour. Bot. XXX. 139 (1892); Syn. Malveae, 53 (1894).

Sida Ghisbreghtiana Turczaninow in Bull. Soc. Nat. Moscou, XXXI. pt. 1, 200 (1858).

Abutilon ? ambiguum Turczaninow in Bull. Soc. Nat. Moscou, XXXI. pt. 1, 205 (1858).

Shrub 2.5–3 m. high or larger, branchlets stellate-pubescent, often furfuraceous. Leaves large, up to 27 cm. long, dark green, sparsely stellate-pubescent or scabrous above, paler, densely and softly stellate-pubescent beneath; lower leaves deeply 5-lobed, the uppermost usually 3-lobed, the lobes ovate-oblong, constricted at the base, acute or shortly acuminate, entire or dentate; petiole up to 15 cm. long, stellate-pubescent, often furfuraceous or merely puberulous. Flowers in ample, open cymose panicles up to 3 dm. long and 2–3 dm. broad, branches and pedicels slender, usually furfuraceous-pubescent or puberulous; pedicels 2–4 cm. long, articulated a little below the flower; sepals broadly ovate-oblong, acute or slightly obtuse, pubescent or puberulous, nectaries present; petals white, 1–1.4 cm. long; staminal column short (4 mm.), conic, glabrous. Carpels 11–13, small, compact, about 1 cm. long, coarsely stellate-pubescent.

MEXICO. Vera Cruz: Orizaba, *M. Botteri*, no. 1134 (G, US); Barranca of Metlac near Orizaba, alt. 900 m., *C. G. Pringle*, no. 5906, Jan. 29, 1895 (G, US); Mirador, Orizaba, *F. M. Liebmann*, no. 430, March 1842 (AA, NY, US); Valley of Cordova, *M. Bourgeau*, no. 1501, Dec. 15, 1867 (G, US); Cordova, *J. M. Greenman*, no. 166, Jan. 25, 1906 (F); Canton de Huatusco, alt. 1200 m., *C. Conzatti*, no. 833, Dec. 1898 (G, US); Barranca de Tenampa, Zacuapan and vicinity, *C. A. Purpus*, no. 2210, Nov. 1906 (F, G, M, NY, US).

FIG. 1. ROBINSONELLA LINDENIANA (Turcz.) Rose & Baker.—Typical leaf, and smaller leaves from the upper part of flowering branches (× ½).

Robinsonella Lindeniana was first described by Turczaninow in 1858 in the same paper as three different species, the two flowering specimens were referred to *Sida* and the fruiting one questionably to *Abutilon*. This species resembles *Sida* only in the solitary pendulous seed in each carpel. Superficially the fruits resemble those of *Abutilon*, section *Gayoides* A. Gray (*S. crispum* Sweet), but differ in being uni-ovulate. Dr. Asa Gray created a separate section for this species in *Sida* and called it *Abutilastrum*. E. G.

Baker retained this section in his Synopsis Malveae and added other species of *Sida*. Later Rose and Baker removed this species from *Sida* and placed it in their new genus *Robinsonella*, which they had established upon *R. cordata*.

Robinsonella Lindeniana may be confused with *R. divergens*, but it has larger palmately 5-parted lower leaves with ovate-oblong constricted lobes, and slenderer and less furfuraceous branches and pedicels in the inflorescence. The sepals of *R. Lindeniana* are ovate-oblong and not reflexed in fruit.

2. Robinsonella divergens Rose & Baker in Gard. & For. x. 245 fig. 32 (1897).—Standley in Jour. Arnold Arb. xi. 34 (1930).—Fig. 2.

Small tree up to to 6 m. high, branchlets with coarse, furfuraceous stellate pubescence (rarely more or less puberulous). Leaves orbicular, cordate, up to 15 cm. long, slightly scabrous above, with dense short stellate pubescence beneath; the lower leaves 3-lobed,

FIG. 2. ROBINSONELLA DIVERGENS Rose & Baker.—Typical leaf, and small leaf from upper part of flowering branches ($\times \frac{1}{2}$).

the lobes acute or obtuse (in extreme forms very large, ovate-oblong, constricted at the base), entire or dentate; the uppermost leaves lanceolate, petioles up to 10 cm. long, coarsely stellate-pubescent (often furfuraceous). Flowers in large cymose-panicles up to 4 dm. long, branches and pedicels stout (if slender more or

less puberulous) covered with a furfuraceous stellate pubescence; pedicels up to 2 cm. long, articulated just below the flower; sepals lanceolate, acute, reflexed in fruit, stellate-pubescent, nectaries prominent; petals white, rarely striped with reddish purple, 0.5–1.5 cm. long; staminal column short (4 mm.), very slender, conic, glabrous. Carpels 9–10, large, spreading and widely separated at apex, strikingly stellate-pubescent or merely puberulous.

CENTRAL AMERICA. Guatemala: Santa Rosa, Dept. of Santa Rosa, alt. 900 m., *Heyde & Lux*, no. 4326, Jan. 1893 (F, G, NY); Cuajiniquilapa, Dept. of Santa Rosa, alt. 750 m., *Heyde & Lux*, no. 6299, Nov. 1893 (F, G). Honduras: vicinity of Siguatepeque, Dept. of Comayagua, alt. 1080–1400 m., *P. C. Standley*, no. 55975, Feb. 14–27, 1928 (AA, F, US); El Salvador: Santa Tecla, *S. Calderon*, no. 1515, March 1923 (G); vicinity of Santa Tecla, Dept. de La Libertad in Cafetal, alt. 790–950 m., *P. C. Standley*, no. 23021, April 10, 1922 (F, G, NY). Nicaragua: between Jinotega and Pantasmo, *A. S. Oersted*, Jan. 1848 (F). Costa Rica: environs de San José, alt. 1200 m., *H. Pittier*, no. 2186, Dec. 1902 (US); San José, bords du rio Torres près San Francisco de Guadalupe, alt. 1135 m., *H. Pittier* (also *Ad. Tonduz*), no. 8471, Dec. 1892–93 (F, US; *syntype*); San José, bord d'un ruisseau, *Ad. Tonduz*, no. 1425, Nov. 28, 1880 (US; *syntype*); San José, alt. 1135 m., *Ad. Tonduz*, no. 7311, Jan. 1893 (F, G, US; *syntype*); San José, alt. 1080 m., *J. D. Smith*, no. 4751, April 1894 (G); vicinity of La Verbena, Prov. of San José, alt. about 1200 m., *P. C. Standley*, no. 32216, Jan. 29, 1924 (F); foothills south of San José, *J. M. & M. T. Greenman*, no. 5500, Feb. 8, 1922 (M); vicinity of San José, alt. about 1130 m., *P. C. Standley*, no. 47333, Dec. 4, 1925–Feb. 10, 1926 (F); mole de San Rafael (plaine du San Carlos), *H. Pittier*, no. 2600, June 1890 (US; *syntype*); environs of San Rafael, *Ad. Tonduz*, no. 1977, Feb. 13, 1890 (US; *syntype*).

Honduran forms of *Robinsonella divergens* resemble *R. Lindeniana* in having very large leaves with ovate-oblong lobes, more open panicles, more slender and less furfuraceous-pubescent branches and pedicels of the inflorescence, but the always three-lobed leaves, lanceolate and reflexed sepals and the larger, more widely separated carpels place them specifically with *R. divergens*.

3. Robinsonella edentula Rose & J. Donnell Smith in Bot. Gaz. XXXVII. 417 (1904).—Rose in Contrib. U. S. Nat. Herb. VIII. 519 (1905).—Fig. 3.

Shrub or small tree, branchlets stellate-pubescent. Leaves suborbicular in outline, 3–9 cm. long, cordate at base with a deep

sinus, irregularly lobed and somewhat unequally-sided, shortly and sparsely stellate-pubescent above, densely and coarsely pubescent beneath, the lobes acute, obtuse or rounded, entire, undulate or slightly dentate, petioles 0.5–3 cm. long, coarsely stellate-pubescent. Flowers very abundant, in short axillary panicles up to 8 cm. long, pedicels slender 8–16 mm. long, stellate-pubescent, articulated near the apex; bracts when present lance-linear; sepals ovate-

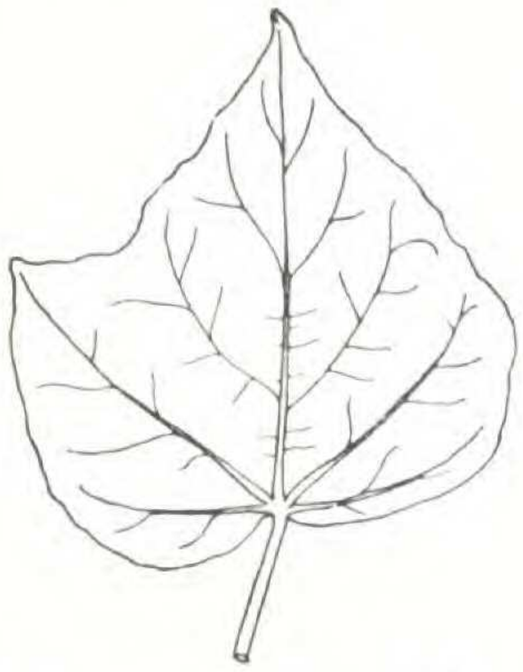

FIG. 3. ROBINSONELLA EDENTULA Rose & Donn. Sm.—Leaf (× ½).

lanceolate, acute, stellate-pubescent, nectaries present; petals violaceous (pale lilac), 1 cm. long; staminal column very short (6 mm.), slender, glabrous. Carpels about 10, small, delicately veined, sparsely pubescent.

CENTRAL AMERICA. Guatemala: Cobán, Dept. Alta Verapaz, alt. 1300 m., *H. von Tuerckheim* no. 665 (Donn. Smith, Pl. Guatem. etc., no. 8382), Nov. 1902 (F, G, NY, US; *holotype*).

4. Robinsonella discolor Rose & Baker in Contrib. U. S. Nat. Herb. v. 181 (1899).—Standley in Contrib. U. S. Nat. Herb. XXIII. pt. 3, 370 (Trees & Shrubs Mex.) (1923).—Fig. 4.

Slender tree 6–9 m. high, branchlets glabrous with yellowish-gray bark. Leaves broadly ovate, up to 12 cm. long, cordate or subcordate at base, often unequally-sided, entire, coarsely dentate or obscurely lobed toward the acute or acuminate apex, discolorous, green above, covered with a fine, densely appressed, silvery tomentum beneath, with a tuft of long soft hairs at the base of the main veins; petioles up to 10 cm. long, puberulous. Flowers borne toward the apex of short lateral branchlets, solitary or in pairs on puberulous pedicels about 2 cm. long, pedicels articulated near the middle; sepals ovate, acute, covered with a fine tomentum, nectaries not evident; petals white, 6–10 mm. long; staminal column short (5 mm.), conic, glabrous. Carpels about 12, more or less compact, minutely stellate-tomentose.

MEXICO. San Luis Potosi: Las Palmas, Limestone hills, alt. 90–120 m., *C. G. Pringle*, no. 5767 (F, G, US; *syntype*) and no. 8007 (AA, F, G, M, NY, US; *syntype*), April 27, 1894 and March 2, 1899.

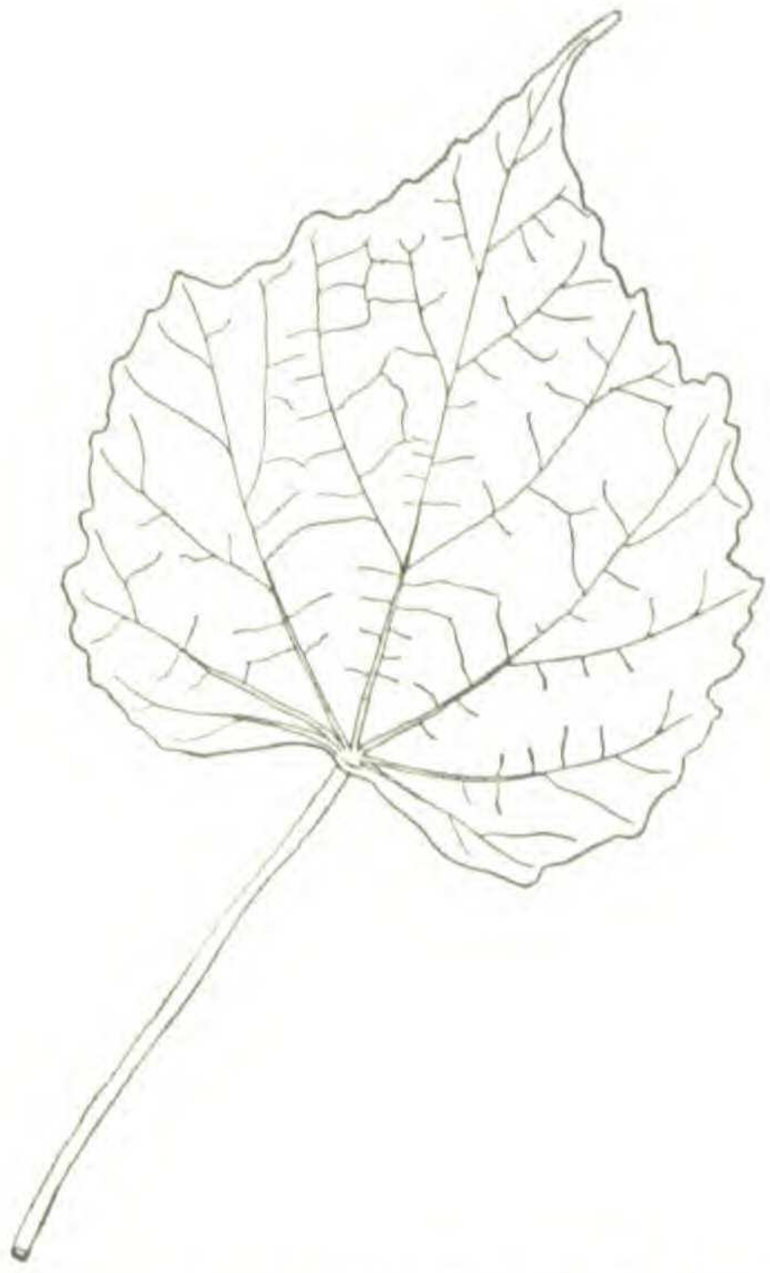

FIG. 4. ROBINSONELLA DISCOLOR Rose & Baker.—Leaf (× ½).

5. Robinsonella subcordata Hochreutiner in Ann. Conserv. Jard. Bot. Genève, XXI. 449 (1920).—Standley in Contrib. U. S. Nat. Herb. XXIII. pt. 5, 1674 (Trees & Shrubs Mex.) (1926).—Fig. 5.

Tree, branchlets with ferrugineous and furfuraceous tomentum. Leaves thick, ovate, 2–2.7 cm. long (young?), subcordate or rotund at base, almost entire, shortly acuminate, slightly tomentose above,

FIG. 5. ROBINSONELLA SUBCORDATA Hochreut.—Leaf (× ½).

densely furfuraceous-tomentose beneath, more or less ferrugineous on the veins; petioles 0.5–1.5 cm. long, densely tomentose, more or less furfuraceous and ferrugineous. Flowers many, congested on short lateral branchlets, pedicels up to 3 cm. long, tomentose, articulated near the middle; sepals ovate, 8 mm. long, acute, prominently one-nerved, gray-tomentose; nectaries evident; petals

pale lilac [?], 2.5 cm. long; staminal column attenuate-conic (8 mm.), stellate-pubescent. Carpels about 13, appressed tomentose when young (mature carpels not seen).

MEXICO. Oaxaca: Jayacatlan, *H. H. Rusby*, without no. (NY, *holotype*).

6. Robinsonella cordata Rose & Baker in Gard & For. x. 244, fig. 31 (1897).—Hochreutiner in Ann. Conserv. Jard. Bot. Genève, XXI. 450 (1920).—Standley in Contrib. U. S. Nat. Herb. XXIII. pt. 3, 761 (Trees & Shrubs Mex.) (1923); pt. 5, 1674 (Trees & Shrubs Mex.) (1926).—Fig. 6.

Tree 4–9 m. high, much branched, branchlets pilose or glabrescent. Leaves up to 15 cm. long, cordate or subcordate at base, long acuminate, dentate or slightly lobed toward the apex, softly

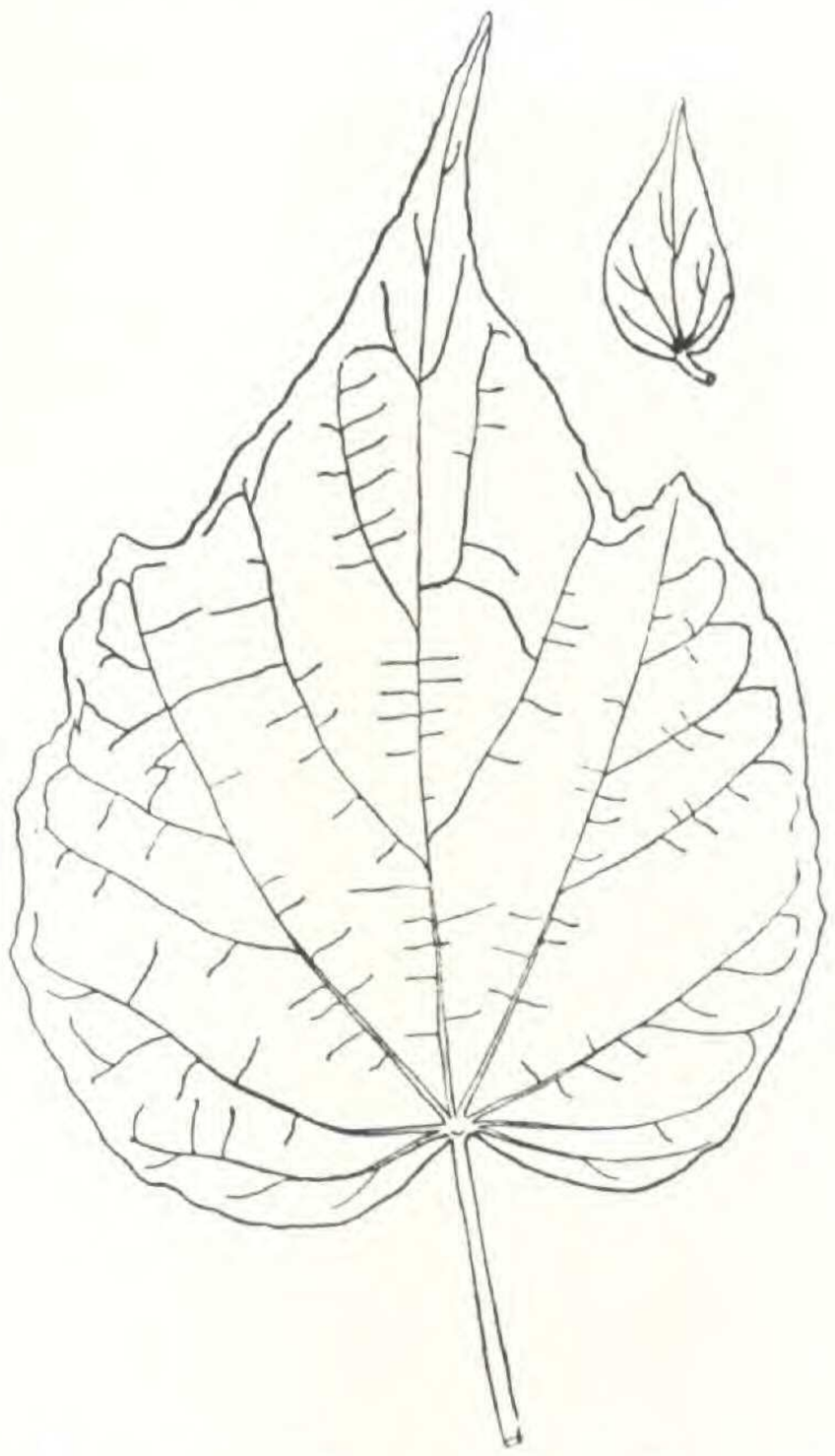

FIG. 6. ROBINSONELLA CORDATA Rose & Baker.—Typical leaf, and small leaf from the upper part of flowering branches (× ½).

pilose or glabrescent above, loosely stellate-pubescent beneath, pilose on the veins, petioles up to 5 cm. long, pilose. Flowers in 2's or 3's on short lateral branchlets; pedicels 1.5–2.5 cm. long, mostly densely pilose or rarely short stellate-pubescent, articulated near the middle; sepals large, ovate-lanceolate, gray-tomentose, not conspicuously nerved, nectaries evident; petals pale lilac

(sometimes white), about 1.5–2.5 cm. long, stellate-pubescent externally near the base; staminal column 5–8 mm. long, minutely and densely stellate-tomentose. Carpels 12–13, distinct nearly to the base, stellate-pubescent or rarely pilose.

MEXICO. Durango: San Ramon, *Edw. Palmer*, no. 54, April 21–May 18, 1906 (G, M, NY, US). Oaxaca: Hacienda de Guadalupe, alt. 1600 m., *C. Conzatti*, no. 2322, Dec. 6, 1908 (F, G, M); Cerro San Felipe, alt. 2000–3000 m., *Gonzales & Conzatti*, no. 881, Aug. 7, 1898 (G, US); alt. 2100 m., *Gonzales & Conzatti*, no. 671, March 7, 1898 (G, US); Tamazulpam, alt. 2000–2135 m., *E. W. Nelson*, no. 1955, Nov. 16, 1894 (US; *syntype*); San Luis Tultitlanapa, Puebla near Oaxaca, *C. A. Purpus*, no. 3251, April–May 1908 (F, G, M, NY, US); Sierra de San Felipe, alt. 2300 m., *C. G. Pringle*, no. 6244, Dec. 11, 1895 (AA, G, F, NY, US; *syntype*) (distributed as *Malva subtriflora* or *Malvastrum subtriflorum*); S. J. del Estado, Rancho de Calderon, alt. 1830 m. *L. C. Smith*, no. 529, Feb. 11, 1895 (G, US); without definite locality: *F. M. Liebmann*, no. 1090, 1841–43 (US); Hacienda de Riego, Tehue (?), cultivated, *C. Patini*, no. 7204a, March 13, 1917 (US).

Considerable variation in this species is shown in the kind and degree of pubescence, dentation and acumination of the leaves, in the size and color of the petals, and in the shape of the sepals. The presence of pilose hairs on veins, petioles, pedicels, calyx and branchlets, with the absence of furfuraceous or ferrugineous pubescence anywhere, are the most distinctive characters which separate this species from *R. subcordata*.

7. **Robinsonella pilosa** Rose in Contrib. U. S. Nat. Herb. VIII. 320 (1905).—Fig. 7.

Shrub or small tree, branchlets grayish-yellow, glabrous. Leaves ovate, up to 10 cm. long, cordate at base, not lobed, glabrescent above, loosely stellate-pubescent beneath, petioles up to 5 cm. long,

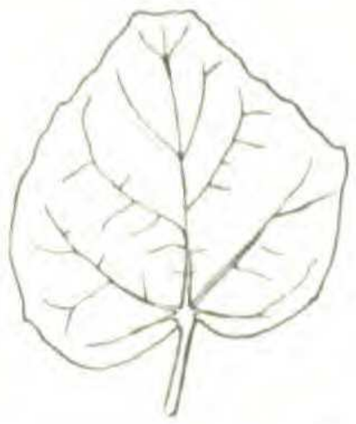

FIG. 7. ROBINSONELLA PILOSA Rose.—Leaf (× ½).

glabrescent. Flowers clustered on short lateral branchlets, pedicels pilose; sepals ovate, obtuse, long pilose in the bud. Carpels 13 (?) fairly long stellate-pubescent, obscurely pilose in the younger stage.

CENTRAL AMERICA. Honduras: Valle de Comayagua, entre Villa de Flores y Comayagua, alt. 690 m., *G. Niederlein*, Feb. 22, 1898 (US, *holotype*).

The material upon which this species was founded is so fragmentary that it is difficult to give its relationship except tentatively as being much closer to *R. cordata* than to *R. edentula* as given in the original description. The pedicels and young flower-buds are as pilose if not more so than in some specimens of *R. cordata*. There is, however, no indication of lobing and no pilose hairs on the fragments of the leaves. A detailed description is not possible from the material available.

NEW SPECIES, VARIETIES AND COMBINATIONS FROM THE HERBARIUM AND THE COLLECTIONS OF THE ARNOLD ARBORETUM[1]

ALFRED REHDER

With a text figure

Taxus cuspidata Sieb. & Zucc. f. **Thayerae** Wilson in Horticulture, VIII. 424, fig. (1930).

A typo recedit praecipue habitu humili depresso ramis gracilibus fere horizontalibus vel patentibus apice ascendentibus.

Plants and specimens examined: plants received in 1924 from the Bayard Thayer estate and now growing in the Arnold Arboretum under no. 17653; herbarium specimens collected in fruit, October 14, 1930.

A very handsome form of the Japanese Yew of low wide-spreading habit with nearly horizontally spreading or somewhat ascending branches. It is much more graceful than the other dwarf forms of *T. cuspidata*, as f. *nana* Rehd. (var. *brevifolia* Hort.) with rather stiff irregularly arranged branches reaching ultimately a height of 2 m., and f. *densa* Rehd. which is a very low and dense cushion-like shrub.

This Yew was raised from seed of *T. cuspidata* by Mr. William Anderson, superintendent of the Bayard estate at Lancaster, Mass. and the largest plants are now about 1.25 m. high and 4 m. in diameter.

Populus cathayana, sp. nov.

Populus suaveolens Schneider in Sargent, Pl. Wilson. III. 18, 28 (1916), quoad specimina sinensia citata.—Rehder in Jour. Arnold Arb. IV. 133 (1923), pro parte; Man. Cult. Trees & Shrubs, 88 (1927), pro parte.—Henry in Gard. Chron. ser. 3, LIII. 198, fig. 88 (1913), quoad icon.; in Elwes & Henry, Trees Gr. Brit. & Irel. VII. 1841, t. 410, fig. 25 (1913), quoad icon.—Non Fischer.

[1] Continued from vol. XI. 168.

Populus szechuanica Schneider in Sargent, Pl. Wilson. III. 21 (1916), quoad specimina Wilsoniana citata, nos. 1413, 2165, 4346, 4348, 4361.
?*Populus balsamifera* var. *suaveolens* Burkill in Jour. Linn. Soc. XXVI. 536 (1899), pro parte.
?*Populus balsaminifera* (*sic*) Kanitz in Szechenyi, Keletasz. Utján. Tudom. Eret. II. 842 (Pl. Enum. 58) (1891); in Szechenyi, Wissenschaft. Ergeb. Reise Ostas. II. 732 (1898).

Arbor ad 30 m. alta, trunco circuitu ad 4 m., omnino glabra; ramuli teretes, hornotini maturi aurantiaci vel fusco-aurantiaci vel griseo-lutei, annotini et vetustiores griseo-lutei, turiones teretes vel leviter obtuse angulati; gemmae purpurascentes elongatae, viscidae. Folia ramulorum fructiferorum ovata vel anguste ovata, 6–10 cm. longa et 3.5–7 cm. lata, papyracea, distincte acuminata, basi rotundata, rarius leviter subcordata, minora interdum latissime cuneata, satis dense crenato-serrulata denticulis adpressis incurvis glanduligeris, ima basi integra vel remote denticulata, supra laete vel intense viridia, subtus albescentia, nervis utrinque 5–7 curvatis ut costa supra leviter subtus magis elevatis, rete venulorum subtus conspicuo et prominulo supra minus conspicuo vel fere obsoleto; petioli subteretes, graciles, 2–6 cm. longi; folia turionum pleraque oblongo-ovata, 12–20 cm. longa et 5.5–10 cm. lata, vel interdum majora basi saepe subcordata, dense glandulosa-denticulata, petiolis 1.2–3 cm. longis. Amenta mascula 5–6 cm. longa, bracteolae fimbriatae, glabrae; stamina 30–35, antheris circiter 2 mm. longis lineari-oblongis quam filamenta longioribus; amenta feminea visa tantum 4–5 cm. longa (vel longiora?), glabra; bracteolae fimbriatae; pedicelli brevissimi circ. 0–5 mm. longi, apicem versus fere 0; perigonii discus patelliformis, basin ovarii tantum cingens, circiter 2.5 mm. diam., margine integro; ovarium glabrum, ovoideum, 2–3 mm. longum, stigmatibus 2–4 dilatatis breviter stipitatis coronatum; amenta fructifera 10–20 cm. longa, fructibus satis distantibus brevissime pedicellatis vel subsessilibus; capsula ovoidea, acuta, 7–9 mm. longa, valvis plerumque 3 vel 4, rarius 2, acuminatis apice recurvis.

China. Szechuan: Fei yueh ling, Ching chi hsien, alt. 2100–2750 ft., *E. H. Wilson*, no. 1432, May 1908 (tree 12 m. tall, girth 1.25 m.; fruiting; type); same locality, *E. H. Wilson*, no. 1431, Oct. 1908 (bark); near Mongkong ting, ascent of Hsao chin ho, alt. 2100–2500 m., *E. H. Wilson*, no. 2164, June 29, 1908 (tree 12–24 m. tall, girth 1.5–2.5 m.; fruiting); west of Kuan hsien, Pan lan shan, alt. 2500–3000 m., *E. H. Wilson*, no. 4348, Oct. 1910 (tree 21–24 m. tall; fruiting); same locality, *E. H. Wilson*, no. 4346, Oct. 1910 (tree 18–24 m. tall; vigorous shoots); northeast of Tachienlu, forests of Ta pao shan, alt. 1600–4200 m., *E. H. Wilson*, nos. 1413, 2165, July 3 and 6, 1908 (tree 15–30 m., girth 1.5–3.5 m.; fruiting branches and